

Global Telecom Network Timing Standards – Decision Day Draws Close!

Currently, telecom networks are fundamentally configured to transport voice, and Ethernet services are piggy backed onto this legacy platform. In the future however the converse will become the norm, networks are being redesigned to transport data, and the traditional voice services are being reconfigured to be compatible, this is known as Voice over Internet Protocol or VoIP. In the future, with much larger IP type bandwidth available, services such as video will be digitised and transported cost effectively – IPTV. This infrastructure revolution is generally referred to as the migration to Next Generation Networks (NGN).

A quieter revolution is taking place behind the scenes in the way these telecom networks manage traffic flow. However, as often happens when new technical concepts emerge, there are alternate solutions to the challenge. Debate surfaced and remains unresolved as to which is the better solution at the recent Workshop in Synchronization for Telecom Systems, which took place under the auspices of the US National Institute of Science and Technology (NIST) and held in Boulder Colorado during March 2006.

A decision about which Standard will predominate in NGNs is brewing between two of the oldest institutions in the field of global technological standards. On the one hand sits the Geneva based International Telecommunications Union (ITU) founded in 1865 from 20 European States to meet and develop a framework agreement covering international telecommunications interconnection and common rules to standardize equipment to facilitate international interconnection. Now under the auspices of the United Nations, the ITU is the de facto governing body for most rules relating to global telecommunications. On the other hand however is the IEEE – the Institute of Electrical and Electronics Engineers and although only formed in 1963 it was created by merging the activities of two much older societies due in part to their efforts in the communications field. These were the American Institute of Electrical Engineers (AIEE), founded in 1884 to advance electrical power technologies, and the Institute of Radio Engineers (IRE), founded in 1912 to explore expanding radio and communications technology.

As the global telecom industry migrates to an all Ethernet environment, the debate is about how the information relating to telecom traffic's relative position and speed (time and timing and often referred to as "synchronization") is passed from one network node to another. ITU is proposing a new international Standard that reviews all aspects of synchronization over Ethernet; this includes in-band (Layer 2) with both two way and one way time-error correction and now an innovative Layer 1 synchronization proposal. This proposes that in the future the Ethernet physical layer is used to pass the synchronization through the network. Previously known as G.pactiming, this new ITU Standard, consented in early 2006 will be known as ITU-G.8261 and Annex A references the physical layer process. However the IEEE is proposing to evolve a timing standard previously created to synchronize (for example) robots in a car assembly plant and known as IEEE-1588. These two global Standards giants have now met, carriers need to evaluate and decide whether "In-band" or "physical layer" is the preferred technique to transport the timing information.

To meet the growing demand for services at ever decreasing prices and recognizing that there is now more value in transporting data rather than traditional voice services, global telecom carriers are migrating to an Ethernet based transport technology and away from the current constant bit rate carrier concept. Traffic flow is traditionally managed through a network by using very accurate timing systems, and effectively resetting the traffic rate at each major intersection in the network. While some traffic speed variation is allowed (picture the rhythmic bunching on congested motorways), there is a well defined limit to this phenomena before services are compromised. The migration to NGNs will remove the built-in mechanism for transporting the time and timing information around the network. Since the Ethernet was never originally conceived as a real-time transport medium for voice and video services, new rules are evolving to ensure that applications which rely critically on the relative time and timing of data arrival can now be transported without degradation to quality.

At WSTS in Boulder, the emerging techniques met head-to-head. The challenge: provide a precise timing signal to synchronize the bit rate for the enabling of traditional time division multiplex (TDM) services over Ethernet. One group – the supporters of in-band (Layer 2) timing splits into two camps. On the one hand the IEEE-1588 Standard proposes that sync be transported within the traffic packet stream using a two

way time transfer protocol. This involves continuously measuring the round trip traffic delay and sending a timing correction signal to the far end to be used to synchronize the circuit emulation bit rate used to time the TDM services. On the other hand another group contends that one-way timing is good enough. The physical layer supporters calling on the new ITU G.8261 Annex A Standard propose a fundamental redesign of the Ethernet physical layer to allow the precise primary reference clock to be carried from point to point throughout the network as it is today in the physical layer of SDH and SONET technology.

Some views expressed at WSTS considered that the telecom industry was repeating the mistakes of old in trying to transport sync over the traffic layer as they did with asynchronous transfer mode (ATM). Many applications, not protected from timing transients caused by traffic mapping activity were severely disrupted and continue to be compromised. If a normally stable, but occasionally disrupted E1/T1 can damage an application, what chance does a corrective algorithm have which is trying to cope with 100 times the timing error? Despite the fact that 1588 proponents showed very good timing transfer results in network trials they must still convince sceptical traditionalists that this can continue to work in busy traffic conditions. On the other hand, do carriers want to redesign their entire Ethernet architecture to leverage the “greenfield” proposals accommodated within G.8261 Annex A?

The debate remained unresolved and the big wireline and wireless carriers are not going to be drawn on which solution to work with for the time being. Gambling network quality – particularly in heavy traffic scenarios – is not the domain of otherwise conservative national carriers who also have an obligation to create a “carrier class” environment from what has traditionally been a “best efforts” solution. So it seems that they will hedge their bets and either wait for 1588 to prove itself, or for G.8261 Annex A compliant equipment to emerge from the development labs. Either way, much time, effort, and debate will be invested and expended over the next few years as the alternative solutions vie for acceptance and adoption.

Having concluded that access layer technology is going through a revolutionary change about as big as the migration from black & white TV to color and with massive impact on applications – what now? A period of review, assessment and analysis of the alternative options must now take place.

One thing is certain, with big stakes to play for as the global telecom industry reinvents itself over the next 5 years to provide new broadband enabled services, both types of traffic management timing solutions will continue to evolve and develop. The debate will certainly carry on behind the scenes and will resurface at the International Telecom Sync Forum (ITSF) – managed by the Institute of Engineering & Technology IET – formerly the IEE) and to be held in Prague November 14th – 16th 2006. Be there if you don’t want to be left behind.

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